

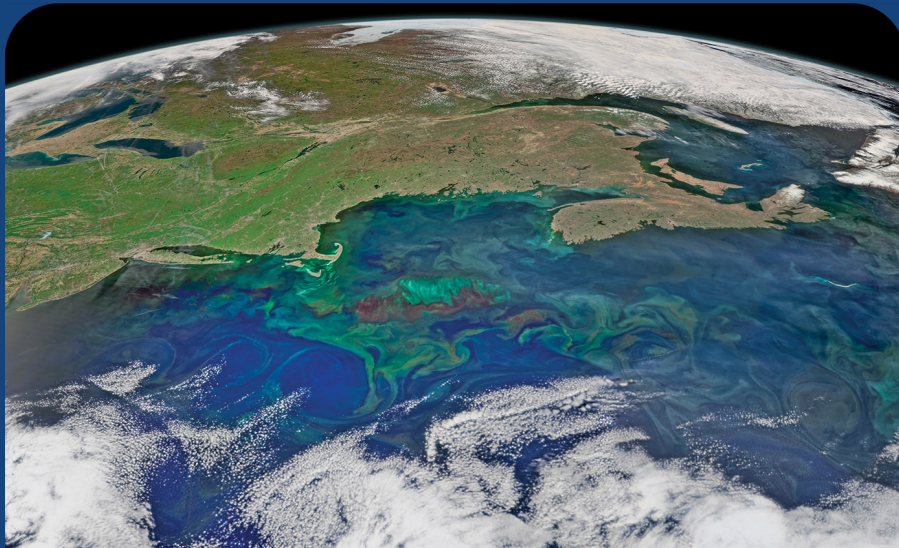
Ocean Green: Blooming Oceans



"Sailing, sailing over the ocean blue." Wait a second. The ocean is not just blue. Take this image of the North Atlantic Ocean as an example. The green swirls you see are trillions of tiny floating organisms that are blooming. Just like plants on land, they also photosynthesize.

Phytoplankton

These plant-like organisms are called phytoplankton, and they really are tiny. In fact, they are microscopic, often smaller than the width of a human hair. Even though these organisms are quite small, they can multiply and spread across hundreds of square kilometers of ocean. What they lack in size they make up for in numbers, producing about half of the oxygen on Earth.



The North Atlantic Ocean swirls with phytoplankton blooms on May 14, 2015. The Visible Infrared Imaging Radiometer Suite (VIIRS) sensor on the Suomi National Polar-orbiting Satellite took this image. Image credit: Norman Kurin

Coccolithophore



The Colors of the Ocean

We can see phytoplankton blooms and measure chlorophyll (the green pigment) from space, just like we do for plants on land. The shades and colors we see within the ocean also tell us about the type of phytoplankton. For example, bright, milky blues tell us that coccolithophores are present in high numbers. Coccolithophores are coated with calcium-carbonate (chalk) scales that reflect sunlight well and look lighter. Greenish-brown areas within a bloom often tell us that diatoms are present.

Coast Huggers

Phytoplankton drift and float where the currents take them. However, phytoplankton grow the best where there is enough sunlight; where mineral nutrients (food) are plentiful; and where the water has just the right temperature. And that is why we see more phytoplankton close to the coasts, where nutrients run-off from land and are blown into the ocean by wind.

Phytoplankton

cyanobacteria



Image credit: Sally Bensusen



diatom



green algae

dinoflagellate



These do not look like your average blades of grass or tree leaves, but these tiny plant-like organisms are made up of even tinier plant cells called chloroplasts. Chloroplasts are filled with chlorophyll that convert nutrients, carbon, and light energy into the sugars they need to survive and the oxygen we need to live and breathe on the Earth.

Data visualizations can be graphs, images, maps, or animations. NASA visualizers take data – numbers, codes, and scientific measurements – and turn them into something people can see and quickly understand.

In this data visualization, you will create your own flipbook animation using maps of chlorophyll content in the oceans and plant greenness on the land. Each still frame shows the average greenness and chlorophyll for one month.

When you look at the frames in order, notice the changes you see from month to month. When you flip through it quickly you can see the Earth change from green to brown on land and greenish-blue to dark blue in the ocean as the year passes. You are seeing the changing of the seasons.

Materials:

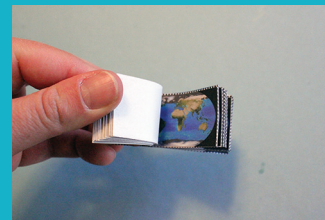
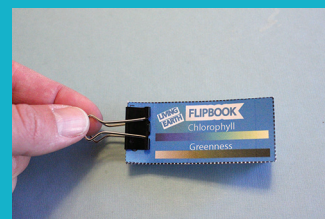
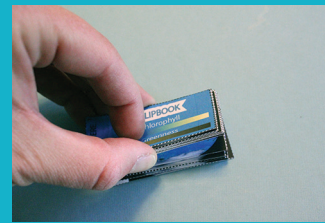
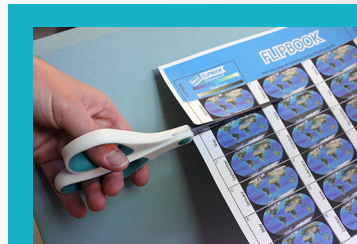
Binder clip
Scissors
Cardstock

Vocabulary:

Animation – A series of images that look like they are moving when shown in order.

Frame – One image in a sequence of images.

Instructions:

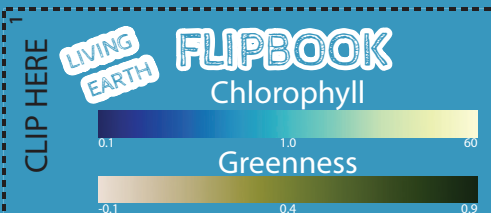


- 1 **Print** flipbook printable on cardstock.
- 2 **Cut** cardstock along the dotted line, making 26 frames.
- 3 **Stack** the 26 frames in order. The frames are numbered.
- 4 **Clip** the stack of frames together, with the binder clip.
- 5 **Flip** through the stack quickly. Watch the animation.



Ship Studies: Phytoplankton

Marine biologists have long studied these plant-like organisms by going to sea. Combining what we learn from ships on the ocean surface with data taken by satellites allows us to have a much wider view and broader understanding of seasons in our oceans.



eo KIDS FLIPBOOK

earth observatory for kids

The book will flip more easily if printed on cardstock.

2

Chlorophyll in plants and phytoplankton reflect green light. This makes plants and phytoplankton blooms look green. Flip to see the land "green up" and the ocean's chlorophyll concentrations change seasonally.

